

1.149,857



# PATENT SPECIFICATION

DRAWINGS ATTACHED

*Inventor:* ALFRED DICKENS BAKER

*Date of filing Complete Specification:* 25 July, 1966.

*Application Date:* 28 April, 1965.

*Complete Specification Published:* 23 April, 1969.

© Crown Copyright 1969.

1.149.857

No. 17813/65.

Index at acceptance:—H2 A (2M, 2E5, 2E11)

Int. Cl.:—H 02 k 9/06

## COMPLETE SPECIFICATION

### Alternators

We, JOSEPH LUCAS (INDUSTRIES) LIMITED, of Great King Street, in the City of Birmingham 19, a British Company, do hereby declare the invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to alternators for use in road vehicles.

An alternator according to the invention comprises in combination a casing, a wound stator carried by the casing, an interdigitated rotor mounted on a shaft journaled for rotation in the casing, the rotor carrying a field winding, brushes and associated slip rings for conveying current to the field winding, a first fan mounted on the shaft adjacent the rotor and within the casing for causing air to flow axially through the casing, around both sides of the stator windings, and a second fan carried by the shaft and positioned externally of the casing to supplement the action of said first fan in causing air to flow axially through the casing, the fans being positioned on opposite ends of the rotor.

One example of the invention is illustrated in the accompanying drawings wherein:

Figure 1 is a circuit diagram of the alternator,

Figure 2 is a sectional side view of the alternator

Figure 3 is a view of the inside of the end cover after it has been removed from the casing of the alternator, this view also showing the slip ring 37 with which the brush 25 is engaged, and

Figure 4 is a view of the exterior of the end cover looking from the left in Figure 2 and with the mounting bracket omitted.

The alternator shown in the drawings embodies features which form the subject matter of co-pending British Applications numbers 17811/65 and 17812/65 (Serial Nos 1149855 and 1149856).

Referring to Figure 1, the alternator includes three delta-connected stator windings 11 the phase points of which are connected respectively to the anodes of three diodes 12, 13, 14 having a common cathode connection to the live alternator output terminal 15, the phase points being further connected to the cathodes of three diodes 16, 17, 18 respectively the anodes of which have a common connection to the earthed alternator output terminal 19. The phase points are further connected to the anodes of diodes 21, 22, 23 the cathodes of which supply power through brushes 24, 25 and associated slip rings to the field winding 26 of the alternator, the current supplied to the field winding 26 being controlled by a voltage regulator 27. The details of the voltage regulator 27 are not important to an understanding of the present invention, but the voltage regulator is conveniently of the form described and illustrated in British Patent No. 1091922.

Referring now to Figures 2 to 4, the alternator comprises a casing consisting of an end bracket 31 by which the alternator is mounted in a vehicle, and a pressed shell 32 which is secured to the bracket 31. The casing supports a pair of bearings 33, 34 which support for rotation a shaft 35 which projects from opposite ends of the casing. The end of the shaft projecting from the bearing 34 is screw threaded for connection to driving means operated by the engine of the vehicle with which the alternator is associated, and the end of the shaft projecting from the bearing 33 has secured thereto a pair of slip rings 36, 37.

The shell 32 carries the stator 38 on which the windings 11 are held, and mounted on the shaft 35 and having a splined connection therewith is an interdigitated rotor 39, 41 carrying the field winding 26. The winding 26 has its opposite ends connected to the slip rings 36, 37 by connecting leads (not shown).

The shaft 35 also carries two fans 42, 43. The fan 42 is mounted on the shaft adjacent

the bearing 34, whilst the fan 43 is positioned between the bearing 33 and the part 39 of the rotor. The blades on the fan 43 are so positioned relative to the fingers on the part 39 of the rotor that when the rotor and fan turn with the shaft 35, the fan 43 will cause air to flow around both sides of the stator windings 11. Thus, at positions such as the position illustrated in the lower half of Figure 2, the fan 43 will drive air towards the finger on the part 41, and this air will flow between the windings 11 and the winding 26 and then circumferentially within the windings 11 when the air reaches the finger seen on the part 41. However, in the position shown in the upper part of Figure 2, the finger on the part 39 substantially prevents air from flowing between the rotor and the windings 11, and so most of the air flows between the windings 11 and the shell 32. In this way maximum cooling of the windings 11 is provided.

The alternator further includes an end cover 44 which is secured to the shell 32 by screws 45 and is provided with holes through which air is drawn by the fans for cooling purposes. The cover 44 defines with the casing a compartment containing the slip rings 36, 37, and carried by the cover 44 and located within the compartment are the voltage regulator 27, the nine diodes and their connections, and the brush box together with the brushes 24, 25 which act on the slip rings 36, 37 respectively. As can be seen from Figure 3, all these components can be removed simply by detaching the end cover 44.

The voltage regulator 27 is carried by a printed circuit board 46 on which are mounted two metal pressings accommodating the brushes and acting as a brush housing. The diodes are located on a second printed circuit board 47, and inputs to the diodes are made in the required manner by soldering the diodes to three flexible conductors 48, 49, 51. These conductors are shaped at one end to provide sockets 52, 53, 54 respectively, and as shown in Figure 2, the stator windings are welded to mating pins, one of which is shown at 55, which when the end cover is placed in position automatically engage the appropriate socket to make the required connections to the flexible conductors 48, 49, 51. The other connections of the diodes are made by engagement of the diodes with the circuits printed on the board 47 which are connected to the output terminals 15, 19 as seen in Figures 3 and 4. The board 47 also provides an output terminal 56 which is connected to the cathodes of the diodes 21, 22, 23 and is also connected to the printed

circuit board 46 and provides the required connection to the voltage regulator, and a terminal 57 which is used to operate a warning light circuit (not shown in Figure 1).

Acting between the conductors 48, 49, 51 and projections on the cover 44 are springs 58 shown in Figure 2. These springs 58 thereby urge the diodes into engagement with the circuits printed on the board 47. The springs 58 further provide a resilient mounting for the diodes, and the arrangement is such that any expansion of the diodes due to the heat generated in them is taken up the appropriate flexible conductor in conjunction with one or more of the springs 58.

It will be noted in Figure 2 that the diodes are provided with small projections on one side of the diode so that the positive and negative sides of the diode can readily be identified. The printed circuit board 47 used consists of a conductive base with a layer of insulating material on the base, and the actual conductors on the insulating material. It will be appreciated that the flexible conductor 48 must be provided with holes to accept the projections on the diodes 12, 22 and that the board 47 must have a hole to accept the projection on the diode 16. Thus, the diode 16 is actually connected to the board 47 electrically, but this does not matter because it can be seen from Figure 1 that the diode 16 is an earthed diode.

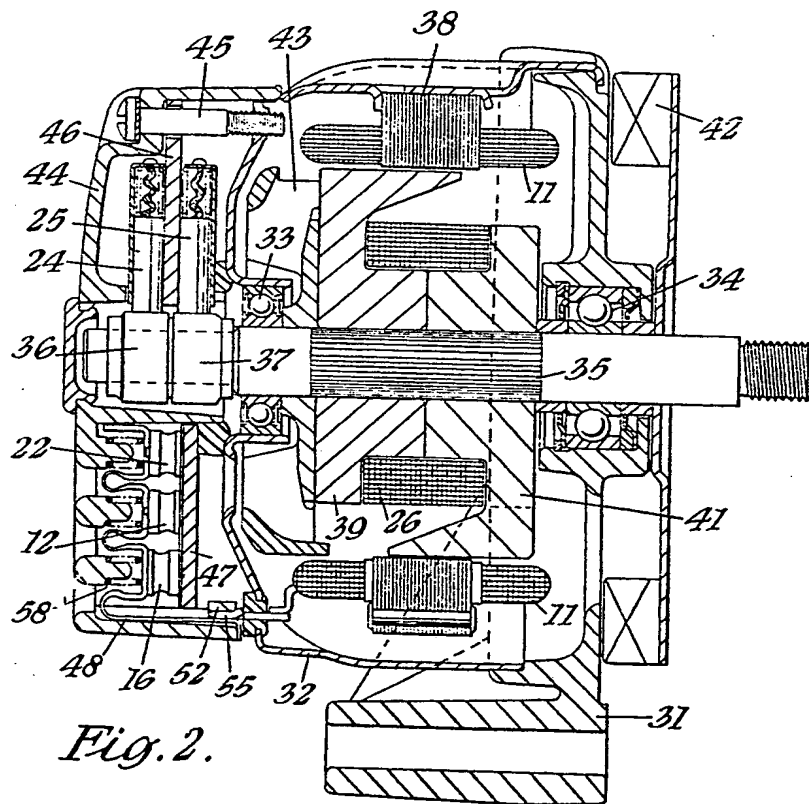
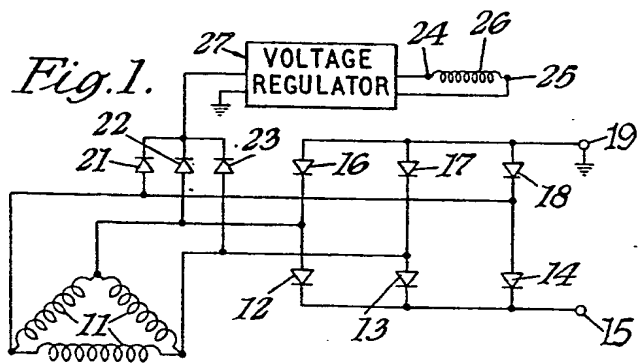
#### WHAT WE CLAIM IS:—

1. An alternator comprising in combination a casing, a wound stator carried by the casing, an interdigitated rotor mounted on a shaft journaled for rotation in the casing, the rotor carrying a field winding, brushes and associated slip rings for conveying current to the field winding, a first fan mounted on the shaft adjacent the rotor and within the casing for causing air to flow axially through the casing around both sides of the stator windings, and a second fan carried by the shaft and positioned externally of the casing to supplement the action of said first fan in causing air to flow axially through the casing, the fans being positioned on opposite ends of the rotor.

2. An alternator as claimed in claim 1 including a full wave rectifier carried by an end cover associated with the casing.

3. An alternator as claimed in claim 2 wherein the rectifier comprises a plurality of diodes carried by a printed circuit board through which connections between the diodes and alternator output terminals are made.

MARKS & CLERK,  
Chartered Patent Agents,  
Agents for the Applicants.



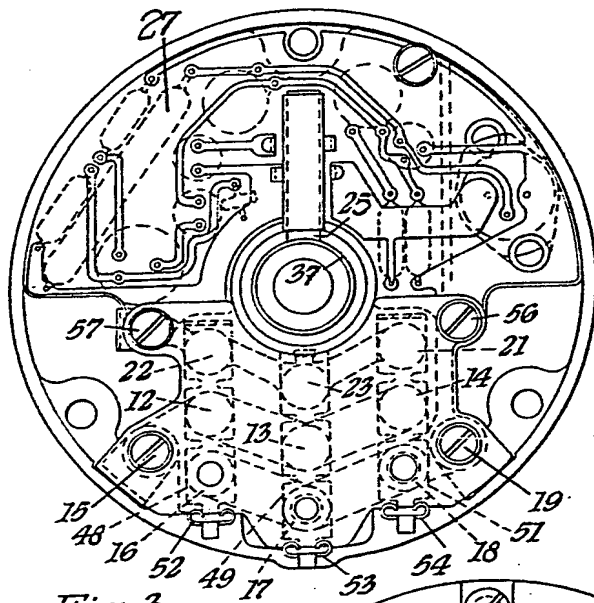
1149857

COMPLETE SPECIFICATION

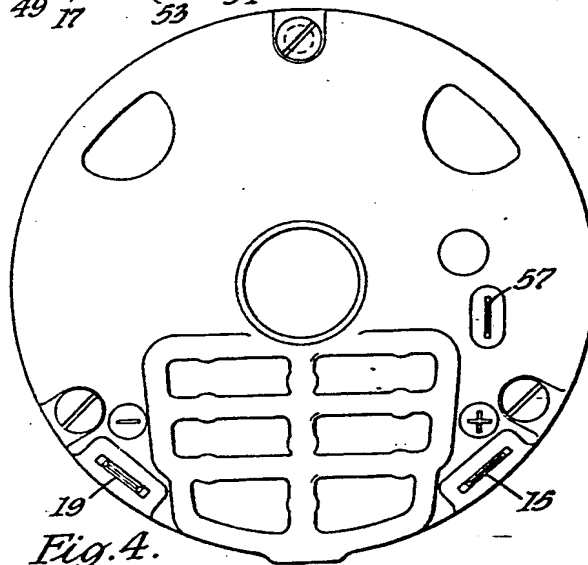
2 SHEETS

*This drawing is a reproduction of  
the Original on a reduced scale*

Sheets 1 & 2



*Fig. 3.*



*Fig. 4.*

